

Notes on Some South African Bees

(Hymenoptera : Colletidae, Megachilidae)

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Wilderness, C. P., South Africa

Since the publication of previous notes on the biology of the following three species of indigenous bees, viz. *Heriades freygessneri* Schletterer (Megachilidae) in 1962; *Megachile (Eutricharaea) gratiosa* Gerstaecker (Megachilidae) in 1963; and *Nothylaeus heraldicus* (Smith) (Colletidae) in 1962, more data has been accumulated necessitating in some respects modification of earlier findings, but also largely confirming as well as adding to the data already published. The following notes deal with all three species referred to above, but before treating each separately a few general remarks may not be out of place.

Since his retirement the writer has been living at Wilderness, C. P., and the artificial nests or "hives" were brought there from Port Elizabeth and set up in the late autumn of 1963. Plastic tubing is now used entirely for the nests. Although slightly opaque it is sufficiently clear to allow of observation. Another advantage is its pliability, thus rendering it easy to pierce holes for ventilation which is very necessary if mold and "sweating" are to be avoided. The most suitable size of tubing was found to be one-fourth inch in diameter; larger sizes are accepted by all species of bee, but they often result in nests which are malformed or out of alignment. Transparent cool-drink "straws," made of cellophane and measuring one-tenth of an inch in diameter were also used but were found to be too small. In a few cases *Heriades freygessneri* managed to nest successfully in them, but the majority nesting attempts were abortive, while the other two species ignored them completely.

At Wilderness, nest sites were established on shelves below east and west facing windows of the writer's dwelling house. All three species have used both aspects, but the easterly one, which is subject to more sunshine in the earlier part of the season, is, on the whole, more favored, except in midsummer and autumn.

The three species are dealt with in detail separately as follows.

HERIADES FREYGESSNERI Schletterer

The first indication of the presence of this species at the nest sites at Wilderness was on 25 November 1963 and it was active there until the following June. During the previous season at Port Elizabeth it had been active at the nest site since July and nesting commenced as early

as 3 August. In the present 1964–1965 season, following upon an unusually long and severe winter with a late spring and summer, this bee was not seen at the nest site until 10 January while at the time of writing, 28 January, only one individual has nested there so far. In all years, however, bees had emerged from nests kept in the insectary from August, the nests concerned having been formed late in the previous season. Such emergences, however, are somewhat sporadic and depend upon climatic conditions (i.e., temperature). Sustained and large-scale emergence does not normally occur until the advent of settled warmer weather, generally in November, but in the present season the peak was not reached until 4 to 6 weeks later (December–January).

Taylor (1962) stated that the male of *Heriades freygessneri* had never been seen at the nest site. Since then, however, males have been observed at and in the nest sites. This was particularly the case during the early part of the season in 1961 at Port Elizabeth when sometimes one and sometimes two males together were noted at rest in the vials or tubes, either in old nests or in as yet unoccupied vials, where they might remain for several days. The male has been recorded seeking the female at the sites as early as 13 September and mating has also been seen there, while attempts by the male to mate with others of its sex have likewise been observed.

During a mild winter, as in 1962, this bee may be active almost throughout. In that year there were some 80 emergences from autumn-constructed nests. Emergences ceased in mid-September and were resumed early in November.

At Wilderness the period occupied by the immature stages, i.e., egg to adult, has been, in those examples which wintered the larval and pupal stages, somewhat longer than at Port Elizabeth, the maximum recorded being 320 days as against 302 days at the latter place. In summer there is little difference and the period usually occupies from 50 to 60 days at both places. A few shorter periods have been obtained, however, the shortest recorded being 1 of 24 days which was quite exceptional. The longest developmental period recorded, 320 days, concerned a nest completed on 20 January 1963, at Port Elizabeth and removed early in May to Wilderness. Although emergences from nests formed in January and February generally take place by the following April at the latest, from this particular nest they did not commence until 28 November and they then continued until 4 December.

In the earlier paper (Taylor, 1962) the maximum number of occupied cells in a nest was given as nine; later as many as 13 cells have been found. At Port Elizabeth the gumlike material used in nest construction

was pine resin and was evidently obtained from pine trees growing in close proximity to the nest site. At Wilderness the gum used varies from white to black in color and is quite odorless. Its source remains undetermined but it is certainly not pine resin while there are no pine trees growing within 200 yards of the nest sites. Pine trees are not, of course, indigenous in South Africa and these bees must normally obtain their gum from other sources.

Although, as stated in the earlier paper, there is a marked tendency for the first emergences from a nest to be males, this is by no means invariably the case. From 82 nests, males commenced to emerge before females in 67, or approximately 81.7 per cent.

The curious habit of *Heriades freygessneri* of dismantling and clearing out nests of its own species only to start building afresh, recorded and referred to earlier (Taylor, 1962), has also frequently been observed at Wilderness, despite the fact of there being ample vacant nest sites at the time. Sometimes a newly emerged female will commence to clear out her own nest before finally leaving it.

NATURAL ENEMIES.—In addition to those mentioned in the earlier paper, two other species of insect parasites have since been obtained from the nests of *Heriades freygessneri*. These are (1) the eulophid *Melitobbia* sp., previously reared from the nests of the leaf-cutting *Megachile* (*Euricharaea*) *gratiosa* Gerstaecker at Port Elizabeth (Taylor, 1963). In 1962 this eulophid was also obtained from the nests of *Heriades freygessneri* at Port Elizabeth. It commenced to emerge from the nests of its host in 21 to 62 days after their completion, but in no case did it affect all the cells as bees also emerged from all the nests concerned. This parasite has not yet been obtained at Wilderness. The other parasite (2) which has been reared from the nests of *Heriades freygessneri* at both Port Elizabeth and Wilderness is the parasitic megachilid *Afrostelis aethiopica* (Friese). This parasitic bee has been obtained from nests in January, February, April, and June. The June individual emerged long before its hosts of the same nest which did not emerge until the following December. On 27 January one of these parasitic bees emerged from a nest sealed on 30 April.

Mention may here be made of a small species of psocid which frequents the nests of the various bees, particularly those of *Heriades freygessneri*. It is a scavenger, however, and apparently does not harm the bees. It has been determined as a species of *Lipocelis*, a genus of worldwide distribution.

MEGACHILE (EUTRICHARAEA) GRATIOSA Gerstaecker

In a previous paper on the subject (Taylor, 1963) details were given of investigations carried out at Port Elizabeth up to the late summer of 1962. These were continued there until May of the following year, and since then at Wilderness, C. P.

Activity at the nest site commenced unusually early in the 1962–1963 season, due probably to the mild winter and spring, and nest construction commenced on 13 August, the earliest date hitherto being 5 September, while the species was to be seen at the site until the end of April (1963). At Wilderness, however, it has been much later in making its first appearance, and in 1963 it was not observed at the sites until 25 November; in the present 1964–1965 season, except for one incompleting nest in October, no indication of this bee was recorded at the sites until 3 January.

Emergences from nests of the previous season kept indoors have also been much later at Wilderness; in 1963, the first emergence took place on 14 December; in 1964, on 30 December. In the present season emergence from wintering nests has not only been later but also fewer in number, while activity at the nest sites has also been considerably less. Up to the end of January not more than three individual female bees have nested. As in the case of *Heriades freygessneri* the general lateness in appearance is attributed to the severe and prolonged winter, while the prevailing conditions of extreme drought are probably largely responsible for the present lack of activity.

The period spent in the nest (i.e., egg to adult) has varied from 30 to 323 days, and while in the majority of nests formed in January and February emergences took place in late summer or autumn, in some cases these were delayed until the following season, even as late as December and January. As before, emergences from any one nest usually took place within a few days of one another, but in one exceptional case there was a time lag of 27 days.

While the majority of nests at Wilderness have been constructed of green leaf, certain individuals seem to prefer flower petals, and these nests, in consequence, present a colorful appearance when fresh. The petals of cultivated *Salvia*, Lavender and *Cassia* sp., also of indigenous species such as *Polygala myrtifolia* and *Virgilia oroboides* (Keurboom), have all been used in nest construction.

NATURAL ENEMIES.—The eulophid *Melitobbia* sp., continued to occur at Port Elizabeth in 1963, and was found to emerge from nests as early as 31 days and might continue to do so for up to 84 days after their

completion. As mentioned when discussing *Heriades freygessneri* this parasite has not hitherto been found at Wilderness. The sarcophagid *Miltogramma*, sp., previously recorded at Port Elizabeth, is of fairly common occurrence at Wilderness and has been reared from summer nests there as well as from those which overwinter. Two individuals of this parasitic fly have been obtained from a single cell nest from which they emerged 20 days after its formation. In another instance the parasite emerged 208 to 211 days after the completion of the host's nest.

At Port Elizabeth a few individuals of a species of *Coelioxys*, a genus of parasitic Megachilidae, were obtained from the nests of *Megachile gratiosa*. This proved to be a new species and has subsequently been named *Coelioxys vumbula* by Prof. J. J. Pasteels of Brussels (personal communication Dr. K. V. Krombein). One of these parasitic bees emerged 34 days after the completion of the host's nest.

POLLINATION OF ALFALFA.—In the previous paper on *Megachile gratiosa* reference was made to another species of Megachilidae, namely *Megachile (Eutricharaea) rotundata* Fabricius, an important pollinator of alfalfa in the Pacific Northwest which is there mass-produced for the purpose.

Several enquiries have been received from the United States of America as to the pollinators of this crop in South Africa, but little seems to be known about the subject here and no specific investigations appear to have been made. It has apparently been assumed that the principal pollinator of alfalfa, or lucerne as it is more generally known locally, is the common Hive or Honey Bee *Apis adansonii* Latr. (usually known as *A. mellifera* in South Africa). The fact that "Lucerne Honey" is so widely known and popular lends support to this assumption.

The writer made a preliminary investigation last summer (1963–1964) in alfalfa lands at Wilderness, and the only bee found in any quantity in attendance on the blossoms was the common Hive Bee. *Megachile gratiosa* was not recorded among the alfalfa, although both sexes were present at the flowers of a composite weed *Senecio ilicifolium* growing at the edges of the alfalfa fields, as well as elsewhere in the vicinity.

Dr. G. E. Bohart, in charge of Wild Bee Investigations at Logan, Utah, in a personal communication, states that honey bees in a warm, dry climate such as in central Utah, California, and Arizona, are efficient pollinators of alfalfa. Climatic conditions in South Africa, where this crop is grown commercially, approximate to those obtaining in the southwestern United States. One would therefore expect the principal pollinator in South Africa to be the honey bee, and investigations at

Wilderness, which is almost next door to the alfalfa producing district of Oudtshoorn, indicate that this is indeed the case.

NOTHYLAEUS HERALDICUS (Smith)

Investigations on this colletid have also been continued and largely confirm but also supplement the data given in the previous paper on the subject (Taylor, 1962). It was then stated that the Membrane Bee appeared to be active throughout the year in the Eastern Cape, and that it nests there almost continuously, as against findings in the Western Cape where there are two generations per year. This has now been confirmed at both Port Elizabeth and Wilderness, and adults have emerged in all months with the exception of February, but emergences from nests formed in late December are soon likely to remedy this omission. The duration of the immature stages (i.e., from egg to adult) has occupied from 38 to 46 days in summer, and from 69 to 119 days in autumn and winter. The parasite *Gasteruption caffrarium* Schletterer has also been recorded at Wilderness, and the duration of its immature stages would appear to approximate to the host's.

The contents of many cells suffer fatally from mold, and quite frequently nests, although fully stocked with food, seem to be completely sterile. Such sterile nests may be the work of old and spent females, as has been suggested elsewhere. Occasionally a tube containing no nest is sealed by a membrane bee.

While emergences from any given nest generally occur on the same day or within a few days of one another they are sometimes spread over a number of days, and the longest period of emergence for one nest was 23 days. This, however, was exceptional. Up to eight adult progeny have emerged from one nest. While the number of cells comprising a nest rarely exceeds eight, it more often varies from three to six. The number of cells seems mainly to be limited by the length of the containing tube or hole.

SUMMARY

An account is given of the occurrence, behavior, and habits of three species of solitary bees, viz. *Heriades freygessneri* Schletterer and *Megachile (Eutricharaea) gratiosa* Gerstaecker (both belonging to the Megachilidae) and *Nothylaeus heraldicus* (Smith) (Colletidae) in artificial nests at Port Elizabeth and Wilderness, C. P. This account supplements and brings up to date earlier and separately published papers on the three species.

Some observations on the pollination of alfalfa in South Africa have been included.

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SCIENTIFIC NOTE

An apparently new dragonfly record for California (Odonata, Libellulidae).—On 26 June 1960, and 12 July 1964, J. W. Kamp of Redding, California and the author collected at Wilson Lake, Tehama County. Wilson Lake is a reedy lake reached by a dirt road that turns to the left off Highway 89 about 2 miles south of Child's Meadow. Each time the males of *Ladona julia* Uhler were taken at the edge of the lake, but no females were taken. Eight male specimens are now at hand. The key character that separates *Ladona* from *Libellula* and *Plathemis* is the two-celled front wing triangle. In five of the eight specimens the triangle is two-celled, in two specimens the triangle is two-celled on the right forewing, three-celled on the left forewing. In one specimen the forewing triangle is three-celled in both forewings. Although the facies is alike in all the specimens and they are obviously a sample from one population, the last specimen will key to *Libellula*. Such variation is frequent in Odonata. *Ladona julia* is easily recognized, once known, even prior to capture. The dorsum of the synthorax and the terga of abdominal segments 2-4 are glaucous, appearing white in the field. The rest of the insect is dark. The males spent their time sitting on the ground at the edge of the lake unless disturbed, and were easy to capture. They were very heavily infested with red mites. Another dragonfly, *Leucorrhinia intacta* Hagen, was common at the same time and place.—J. W. TILDEN, *San Jose State College, San Jose, California.*